Abstract

At the end of the application, please add the Abstract attached hereto this Preliminary Amendment on a separate piece of paper.

In the Claims:

Please cancel claims 1-64 without prejudice or disclaimer.

Please add the following new claims.

65. An article comprising:

first and second portions fastened together by a releasable fastener device;

wherein the releasable fastener device comprises shape memory material and is in the form of a female element threadedly engaged with a complementary male element through a first threaded engagement region of the shape memory material provided on one of the female element and the male element and a second threaded engagement region provided on the other one of the female element and the male element;

the threaded engagement region of the female element radially grips the threaded engagement region of the male element; and

the releasable fastener device is operative upon shape transition to change the cross-sectional shape of the first threaded engagement region to radially move the first threaded engagement region clear of the second threaded engagement region so as to release the threaded engagement between the male and female elements and leave the male element free to withdraw from the female element without having to be unscrewed therefrom.

66. An article according to claim 65, wherein the first threaded engagement region of the shape memory material is provided on the female element.

67. An article according to claim 66, wherein the shape memory material is a shape memory polymer.

68. An article according to claim 66, wherein the shape memory material is operative to change the cross-sectional shape of the first threaded engagement region provided on the female element from generally oval to generally round, in order to increase the minimum radial dimension of the cross-section and thereby release the male element.

69. An article according to claim 68, wherein the female element comprises a generally annular member, and wherein the shape memory material is operative upon shape transition to cause the female element to lengthen in a generally axial direction and concurrently to enlargen the inner diameter of the female member, thereby to release the threaded engagement with the male element, and to generate a separation force in the axial direction.

70. An article according to claim 69, wherein the shape memory material is a shape memory polymer.

71. An article according to claim 66, wherein the female element comprises a generally annular member, and wherein the shape memory material is operative upon shape transition to cause the female element to lengthen in a generally axial direction and concurrently to enlargen the inner diameter of the female member, thereby to release the threaded engagement with the male element, and to generate a separation force in the axial direction.

72. An article according to claim 71, wherein the shape memory material is a shape memory polymer.

73. An article according to claim 65, wherein the first threaded engagement region of the shape memory material is provided on a shank of the male element.

74. An article according to claim 73, wherein the shape memory material is a shape memory polymer.

75. An article according to claim 73, wherein the shape memory material is operative to change the cross-sectional shape of the shank from generally oval to generally round, in order to decrease the maximum radial dimension of the cross-section, and thereby release the threaded engagement with the female element.

76. An article according to claim 75, wherein the shape memory material is a shape memory polymer.

77. An article comprising:

first and second portions which are integrally connected to each other through a connection region; and

an actuator element made of shape memory material and embedded or inserted in said connection region;

wherein the arrangement is such that, upon shape transition, the actuator element exerts a force which breaks open said connection region to break apart the first and second portions.

78. An article according to claim 77, wherein the actuator element is an elongate element which, upon shape transition, bends to generate said force.

79. An article according to claim 78, wherein the actuator element comprises a generally straight elongate portion.

80. An article according to claim 79, wherein the shape memory material is a shape memory alloy.

81. An article according to claim 77, wherein the actuator element is a curved or bent element which is operative to uncurve, or unbend, to generate said force.

82. An article according to claim 81, wherein the shape memory material is a shape memory alloy.

83. An article according to claim 77, wherein the actuator element is arranged, upon shape transition, to change its cross sectional shape to generate said force.

84. An article according to claim 83, wherein the shape memory material is a shape memory alloy.

85. An article comprising:

first and second portions which are distinct parts fastened together in assembled relation by a snap fit connection; and

an actuator element made of shape memory material and positioned between the first and second portions;

wherein the arrangement is such that, upon shape transition, the actuator element pushes apart the first and second portions with sufficient force to overcome the snap-fit connection between the first and second portions.

86. An article according to claim 85, wherein the actuator element is an annular element or a helical coil element which, upon shape transition, lengthens generally in an axial direction.

87. An article according to claim 86, wherein the shape memory material is a shape memory alloy.

88. An article according to claim 85, wherein the actuator element is an elongate element which, upon shape transition, bends to generate a separation force.

89. An article according to claim 88, wherein the actuator element comprises a generally straight elongate portion.

90. An article according to claim 89, wherein the shape memory material is a shape memory alloy.

91. A method of disassembling an article comprising first and second elements of shape memory material, the first element having a different shape transition temperature from the second element, the method comprising subjecting the article to a temperature gradient to trigger sequential shape transitions of the first and second elements at different temperatures to produce sequential disassembly of the article.

92. A method according to claim 91, wherein the temperature gradient is an increasing gradient and is achieved by passing the article through regions of elevated and successively increasing temperature.